

What is claimed is:

1. A blank alternating aperture phase shift photomask comprising:
  - (a) a photosensitive resist material layer;
  - (b) an opaque layer underlying said photosensitive resist material layer;
  - (c) a deposited substantially transparent layer underlying the opaque layer;
  - (d) a substantially transparent etch stop layer underlying the deposited substantially transparent layer; and
  - (e) a substantially transparent substrate underlying the substantially transparent etch stop layer,

wherein said deposited substantially transparent layer is of a thickness equal to  $\lambda/2(n-1)$ , where  $\lambda$  is a wavelength of an exposure tool intended to be used with said photomask after processing.

2. The blank alternating aperture phase shift photomask of Claim 1, wherein said substantially transparent etch stop layer is comprised of  $MgF_x$ .
3. The blank alternating aperture phase shift photomask of Claim 1, wherein said substantially transparent etch stop layer is comprised of  $Al_2O_3$ .
4. The blank alternating aperture phase shift photomask of Claim 1, wherein said substantially transparent etch stop layer is comprised of  $Al_xN_y$ .
5. The blank alternating aperture phase shift photomask of Claim 1, wherein said substantially transparent substrate comprises either quartz, glass and/or fused silica and said opaque layer comprises chromium.

6. A method for creating an alternating aperture phase shift photomask from a blank photomask comprising the steps of:
  - (a) providing said blank photomask comprising a photosensitive resist material layer; an opaque layer underlying the photosensitive resist material layer; a deposited substantially transparent layer underlying the opaque layer, a substantially transparent etch stop layer underlying the deposited substantially transparent layer, and a substantially transparent substrate underlying the substantially transparent etch stop layer;
  - (b) forming in said blank photomask a first set of at least one light transmitting opening exposing said deposited substantially transparent layer; and
  - (c) forming in said blank photomask a second set of at least one light transmitting opening in which a portion of said deposited substantially transparent layer has been removed and a portion said substantially transparent etch stop layer has been exposed.
7. The method of Claim 6, wherein said substantially transparent etch stop layer is comprised of  $MgF_x$ .
8. The method of Claim 6, wherein said substantially transparent etch stop layer is comprised of  $Al_2O_3$ .
9. The method of Claim 6, wherein said substantially transparent etch stop layer is comprised of  $Al_xN_y$ .

10. The method of Claim 6, wherein said substantially transparent substrate comprises either quartz, glass and/or fused silica and said opaque layer comprises chromium.
11. The method of Claim 6 further comprising the steps of:
  - (d) repairing a defect over said substantially transparent etch stop layer by using a focused ion beam with  $\text{XeF}_2$  chemistry.
12. An alternating aperture phase shift photomask comprising:
  - (a) a patterned opaque layer with a first set of at least one light transmitting openings and a second set of at least one light transmitting openings;
  - (b) a deposited substantially transparent layer underlying the opaque layer wherein the deposited substantially transparent layer has corresponding light transmitting openings to each of the openings of the first set of at least one light transmitting openings,
  - (c) a substantially transparent etch stop layer underlying the deposited substantially transparent layer, and
  - (d) a substantially transparent substrate underlying the substantially transparent etch stop layer.
13. The alternating aperture phase shift photomask of Claim 12, wherein said substantially transparent etch stop layer is comprised of  $\text{MgF}_x$ .
14. The alternating aperture phase shift photomask of Claim 12, wherein said substantially transparent etch stop layer is comprised of  $\text{Al}_2\text{O}_3$ .

15. The alternating aperture phase shift photomask of Claim 12, wherein said substantially transparent etch stop layer is comprised of  $\text{Al}_x\text{N}_y$ .
16. The alternating aperture phase shift photomask of Claim 12, wherein said substantially transparent substrate comprises either quartz, glass and/or fused silica and said opaque layer comprises chromium.
17. A method for manufacturing a semiconductor comprising the steps of:  
interposing an alternating aperture phase shift photomask between a semiconductor wafer and an energy source, wherein said alternating aperture phase shift photomask comprises:
  - an patterned opaque layer with a first set of at least one light transmitting openings and a second set of at least one light transmitting openings;
  - a deposited substantially transparent layer underlying the opaque layer wherein the deposited substantially transparent layer has set of corresponding light transmitting openings to each of the openings of the first set of at least one light transmitting openings;
  - a substantially transparent etch stop layer underlying the deposited substantially transparent layer; and
  - a substantially transparent substrate underlying the substantially transparent etch stop layer;generating energy in the energy source;

transmitting the generated energy through said first and second sets of at least one light transmitting openings and said set of corresponding light openings; and

etching an image on the semiconductor wafer corresponding to a pattern formed by said first and second set of at least one light transmitting openings and said corresponding set of light transmitting openings.

18. The method of Claim 17, wherein said substantially transparent etch stop layer is comprised of  $MgF_x$ .
19. The method of Claim 17, wherein said substantially transparent etch stop layer is comprised of  $Al_2O_3$ .
20. The method of Claim 17, wherein said substantially transparent etch stop layer is comprised of  $Al_xN_y$ .
21. The method of Claim 17, wherein said substantially transparent substrate comprises either quartz, glass and/or fused silica and said opaque layer comprises chromium.
22. A blank phase shift photomask comprising:
  - (a) a photosensitive resist material layer;
  - (b) an opaque layer underlying said photosensitive resist material layer;
  - (c) a deposited partially transparent layer underlying the opaque layer;
  - (d) a substantially transparent etch stop layer underlying the deposited partially transparent layer; and
  - (e) a substantially transparent substrate underlying the substantially transparent etch stop layer.

23. The blank phase shift photomask of Claim 22, wherein said substantially transparent etch stop layer is comprised of  $MgF_x$ .
24. The blank phase shift photomask of Claim 22, wherein said substantially transparent etch stop layer is comprised of  $Al_2O_3$ .
25. The blank phase shift photomask of Claim 22, wherein said substantially transparent etch stop layer is comprised of  $Al_xN_y$ .
26. A blank photomask comprising:
  - (a) a photosensitive resist material layer;
  - (b) an opaque layer underlying said photosensitive resist material layer;
  - (c) a substantially transparent etch stop layer underlying the opaque layer; and
  - (e) a substantially transparent substrate underlying the substantially transparent etch stop layer.
27. The blank photomask of Claim 26, wherein said substantially transparent etch stop layer is comprised of  $MgF_x$ .
28. The blank photomask of Claim 26, wherein said substantially transparent etch stop layer is comprised of  $Al_2O_3$ .
29. The blank photomask of Claim 26, wherein said substantially transparent etch stop layer is comprised of  $Al_xN_y$ .